

## The White Border of *Euvanessa antiopa*, L.

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The pioneers of Entomology in this country laid great stress on the frequency with which a white border was found in British *antiopa* and in the older works the insect is often called the "white border" or "white petticoat." Haworth in discussing their origin says, "to suppose they come from the continent is an idle conjecture, because the English specimens are easily distinguished from all others by the superior whiteness of their borders." A long time has passed since we had an *antiopa* year, and it is now firmly established that they do come from abroad and are not bred in this country as Haworth believed.

Continental specimens are stated to have a pale border after hibernation, and almost all entomologists now consider that the white border of British *antiopa* is merely due to fading.

Tutt in his *British Butterflies*, p. 329, says "it was once supposed that the British specimens always had a white, instead of a cream-coloured, border, but this has been quite disproved."

Verity states that in Europe no specimen emerges from the chrysalis with a white border (*Ent. Record*, 1916, xxviii., p. 102). Many of the earlier entomologists were very accurate observers, and, I think, if we look at contemporary records, we shall find that we have discarded their conclusions too readily.

The following passage occurs in Newman's *British Butterflies*, "William Backhouse, in 1820, saw great numbers strewing the sea-shore at Seaton Carew both in a dead and living state, one of these in his collection has the pale whitish margin to the upperside of the wings so characteristic of our British specimens." In the periodicals of 1872, another year in which *antiopa* was abundant, there are numbers of records of specimens with white borders captured in August and September in good condition. Many of these must have been caught soon after having emerged from the pupa, and the whiteness of the border cannot have been due to fading.

It is said that in many cases the white border has been produced artificially, and it will be shown that at least one reputed British specimen is a faked example. But it seems most unlikely that faking would have been resorted to if the majority of British *antiopa* had not had a genuine white border.

I will now bring forward some new evidence of a different kind, which, I hope, will convince everyone that the old views were correct and that the modern ones are wrong. In the course of examination of many aberrations of Lepidoptera for scale defects I noticed in the British Museum collection an *antiopa* in bred condition from France with pale grey nearly transparent border, dull blue spots, and the ground colour a little paler than usual. Under the microscope all the upper and lower scales of the border were seen to be so extremely thin and tightly rolled up as to resemble hairs and to be quite transparent owing to absence of pigment. The blue scales were found to be rolled up or twisted, but the chocolate scales were normal in shape although a little less pigmented than usual. This discovery led me to examine a number of British specimens with the following result.

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*British Museum General Collection.*

(1) Ponder's End. August, 1880. Leech Coll. White border. Good condition. Upper scales of border very thin, transparent and rolled up. Blue scales normal.

(2) Scarborough, 1872. Leech Coll. The border and other pale areas have been carefully painted white. It is probably a faked continental example.

*Doubleday Collection.*

(3-9) Seven specimens with no data. All have white borders. The first three have the upper scales of the border thin and rolled up, and the under scales thin and transparent and in some cases curled up at the edges. The blue scales are normal.

The fourth has the scales of the border in the same condition, but the blue scales are rather thin and pale. The fifth and sixth have the same scale defect in the border, but the blue scales are normal. In the seventh, a worn specimen, the under scales of the border are flat and pigmented, but such upper scales as remain are deficient in pigment and curled at the edge or rolled up. The blue scales are thin and some are curled or rolled up, while others are bent over sharply in the middle exposing the lower surface in the distal part.

*Bankes' Collection.*

(10) Tottenham, 1877. In fine condition with white border. All the upper scales of the border and costal markings are thin, rolled up and devoid of pigment, but the light brown and blackish scales, which produce the speckled appearance of the border, and the blue scales are normal.

(11) Ex. Coll. John Scott. Pale cream coloured border. Upper scales with some pigment but curled at the edges and in some cases rolled up.

(12) Swalescliffe, nr. Whitstable, 1906. Deep cream border. All scales normal.

(13) Rev. E. N. Blomfield, Hastings. September, 1889. This specimen, which is supposed to have been bred in England because it discharged red fluid after capture (Barrett; *Lepidopt. Brit. Isles*, vol. i., p. 143), has a deep cream border with normal scales.

(14) G. L. Mosley. Huddersfield, 1872. Cream border. Normal scales.

(15) Ilford, Essex. August 15th, 1872. Ex. Dobrée-Fox Coll. Cream border with scales pigmented, but a little curled over along the edges.

(16) Caught by W. C. Bishop, Emmanuel College, near Baitsbite Lock, and given to his friend F. D. Wheeler. This has a whitish border with the upper scales transparent and rolled up. The blue scales are normal.

(17) Horning, 1872. Ex. P. B. Mason Coll. Cream border with no scale defect.

*British Museum (British Collection).*

(19) Female with white border. Extreme thinness, transparency and rolling up of upper scales of border and costal markings. Blue normal.

(20) E. Vigors' Coll. White border with as marked a scale defect as 19.

(21) Stephens' Coll. White border with very defective scales as in 19.

(22) Stephens' Coll. White border with very defective scales. Some blue scales rolled up a little.

(23) Stephens' Coll. White border with upper scales rolled up. Blue normal.

(24) Stephens' Coll. White border. Extreme thinness, transparency and rolling of upper scales in border. All blue scales thin and rolled up.

(25) No data. White border with same degree of scale defect as 23. A few blue scales rolled up.

(26) Captured by P. H. Desvignes, Lewisham, August 25th, 1872. White border with upper scales extremely thin and tightly rolled. Some blue scales rolled up.

(27) Ex Vigers' Coll. White border. Scales of border and costa thin and rolled up, but blue scales unaltered.

(28) Stephens' Coll. White border and costal markings in which upper scales are thin and rolled up. Blue normal.

(29) No data. (Set as underside). On upperside, border is white with thin rolled up upper scales.

(30) Stephens' Coll. (Set as underside). On upperside, border is white with upper scales thin and rolled up.

(31) J. H. Durrant's specimen. Captured Eedle, Horning Fen, 1873. In good condition with light border. Upper scales of border and costal markings thin and rolled up. Blue normal.

(32) J. H. Durrant's specimen. Captured by Eedle, Horning, 1873. White border with scales rolled up and transparent. Blue normal.

(33) Dr. Gifford Nash's specimen. Captured by Dr. Hallett, Kimbolton. White border with upper scales very thin and rolled up, under scales flat. Blue normal.

The scales on the under surface of the border were examined in a few specimens and found to be defective also.

Excluding the painted specimen from the Leech collection, out of 32 British *antiopa* 28 have abnormal scales in the border and pale costal markings, and in addition four have the scales in the blue spots defective.

The whitest specimens have the most defective scales in the border and only the most defective have abnormal blue scales. The scales of the upper layer are the first scales to show the defect, the scales of the lower layer and the blue scales are less easily altered. None of the British specimens are as abnormal as the French one, but the difference is one of degree not of kind.

The defect is of exactly the same nature as that in many other aberrations of Lepidoptera, and is due not merely to lack of pigment but to abnormal thinness of the chitinous part of the scale. It is a defect, which must be present when the insect emerges and which cannot be acquired afterwards.

This discovery makes it interesting to know the continental distribution of the white bordered *antiopa* and the proportion it bears to the cream coloured form in different localities.

In spite of the abundance of the species I can find few references to this. Barrett states that white bordered *antiopa* are common in Norway.

Linnæus in his *Fauna Suecica* describes the species as 'marginæ albo.'

Zetterstedt in *Insecta Lapponica*, p. 894, says "it is no rarity in Norway, Sweden and Lapland and has white margins."

Schoyen gives Arctic Norway and Labrador as localities, but does not mention the colour of the border (*Archiv. f. Mathematik og Naturvidenskab*, Christiania, 1880, v., pp. 119-228). Snellen says it is scarce in Holland and the border is yellow or white (*De Vlinders van Nederland*, p. 37). In Germany and France specimens with cream border are the rule. In America the border is even darker than in central Europe, but Lord Rothschild has seven from Yukon Territory all of which have white borders. He very kindly allowed me to examine two of these labelled Dawson, May, 1914. Both have the upper scales of the border and costal markings transparent, thin and rolled up, some so rolled that they look like hairs. The scales on the under surface are similar but not quite so defective. The chestnut and blackish scales, with which the border is heavily peppered, are all normal. The blue scales are pale in both, flat in one and curled over or rolled up in the other. The only two Norwegian specimens I have been able to examine are in the British Museum labelled "Knoblock, Norwegian Lapland, 1903." Both have white borders with the upper scales all very thin and rolled up to form a pointed extremity.

One has the blue scales of the forewings all rolled up and some of those in the hindwings in a similar condition, the other has some blue scales flat, others rolled up.

Mr. G. Talbot says there are no specimens in the Hill Museum from Scandinavia or Arctic America. A white bordered specimen from Platea, Greece, which has undoubtedly been on the wing for some time has normal scales. No doubt it is faded.

A specimen, slightly yellowish, from Ancona, Italy, has some normal and some defective scales, and in a similarly coloured one from Central Russia all intermediate forms are found between quite pointed scales and large dentate ones.

From this evidence one gathers that a large proportion of the *antiopa* found in Europe and America in the Arctic Circle at the northern limit of their range are white bordered, and that this form becomes much scarcer further south.

This supports Stainton's contention that the majority of British *antiopa* are immigrants from Scandinavia and not from the south. (*Ent. Month. Mag.*, 1872-73, ix., pp. 105-107).

If so, there ought to be records of its unusual abundance in Scandinavia in the great *antiopa* years.

The only reference to this, which I can find, is in the *Zoological Record*, vol. ix., when it states that this species was much commoner than usual throughout Northern Europe in 1872.

It would be very interesting to know whether the scale defect is hereditary, or whether it is due to the uncongenial climatic conditions near the northern limit of its range.

Norwegian entomologists could easily settle the question by breeding from white bordered specimens.

The result would throw light on all the other scale defects, in which one part of the pattern is affected and the rest remains unaltered.

Temperature experiments have not produced white bordered specimens, so that I am inclined to think it is hereditary. In conclusion I should like to thank Lord Rothschild, Messrs. Durrant, Riley and Talbot, and Dr. Nash for their kindness in helping me so readily.

Since I wrote my article Professor Poulton has allowed me to examine the *antiopa* in the Hope Collection. There are 24 British specimens of which nine are from the Dale Collection. Nineteen have defective scales in the border, and six have defective blue scales. One from Latham taken near London about 1793 has the upper scales of the costa and border thin and rolled to a point, and some of the blue scales near the apices of the forewings pale and rolled up. One with the border nearly white, labelled "Kirkman's Sale 1847," has the upper scales so tightly rolled as to resemble hairs; and some of the under scales have their edges curled up and many of the blue scales also. Kirkman's other specimen, 1847, has the border cream coloured and the scales normal. Of the remaining fifteen all except four have some defect of the upper scales of the costa and border; two of these labelled "Hope" have the under scales transparent and curled at the edges. Two taken by the Misses Lowe in August and September, 1872, both in good condition, show the defective upper scales very clearly.

Another in fair condition with very pale border, labelled "August 29th, 1900, nr. Dunmow, Bigods, Meldola Coll.," shows extreme transparency and rolling up of the upper scales.

A hibernated specimen from Mapledurham, and one labelled "H. S. Sellon Coll., Worthing, 1879," has abnormal blue scales in addition to the thin, tightly rolled upper scales of the border. Of the Continental specimens a very worn one from Lapland has the few remaining upper scales thin and rolled up and the under scales flat and transparent. The blue scales on the forewings are thin and rolled up, and many of those on the hindwings are curled or bent over. A female in very good condition labelled "N.W. Finland between Muonio and Kitila, 17. viii. 97, H. C. Playne and A. F. R. Wollaston," has all the upper scales in the pale cream border rolled up very uniformly, but the blue scales are flat. A specimen with a slightly darker border from the same locality has all the scales normal. A worn female from "Hyères, S. France, 19. iii. 98," with a pale border, has the upper scales thin and rolled up, and the blue scales nearly all curled up at the edges, and a worn female from Courmayeur, Savoy, 6500 feet, has extremely defective upper scales in the pale border and curling of the blue scales.

Dr. Staudinger has sent me a pale bordered *antiopa* in very good condition from "Kentei, Trans-Baikal Province, Siberia," in which the upper scales of the border and costa are transparent and tightly rolled up and some of the blue scales rolled up too. In the British Museum are two specimens with the upper scales so thin and tightly rolled that they look like hairs, and all the blue scales also are very thin and rolled up to a point. One is from Bhotan, the other was taken by Lord Walsingham at Camp 44, California, Western United States of America.

The presence of the same scale defect in these British *antiopa* from